

Appln No. 10/002,703

Amdt date January 8, 2004

Reply to Office action of November 4, 2003

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1. (Withdrawn) An optical transmission method comprising:

selecting a laser from an array of lasers, each laser emitting light at differing wavelengths;

establishing an optical path from the laser to an optical output, such that light from the laser is transmitted into an optical output; and

adjusting the optical path to maximize output power of the emitted light at the optical output.

Claim 2. (Withdrawn) The method of claim 1 wherein selecting a laser comprises:

receiving an indication of a desired wavelength;

choosing a laser from the array of lasers that has the desired wavelength; and

causing the chosen laser to emit light.

Claim 3. (Withdrawn) The method of claim 1 wherein establishing an optical path further comprises

determining a position that causes an optical element to direct light from the selected laser to the optical output; and placing the optical element in the determined position.

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Claim 4. (Withdrawn) The method of claim 3 further comprising:

measuring output power of the emitted light at the optical output; and

determining an expected output power that corresponds to the selected laser.

Claim 5. (Withdrawn) The method of claim 4 wherein determining an expected output power comprises:

establishing a lookup table, the table having entries in which individual lasers in the laser array are each assigned an output power value; and

identifying an entry in the lookup table that corresponds to the selected laser.

Claim 6. (Withdrawn) The method of claim 4 wherein adjusting the optical path is based on a comparison of the measured output power to the determined expected output power.

Claim 7. (Withdrawn) The method of claim 4 further comprising generating an adjustment signal based on the comparison of the measured output power and the predetermined output power.

Claim 8. (Withdrawn) The method of claim 7 further comprising determining a movement direction based on the adjustment signal.

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Claim 9. (Withdrawn) The method of claim 4 wherein adjusting the optical path is based on a comparison of the measured output power to the determined expected output power.

Claim 10. (Withdrawn) The method of claim 7 wherein adjusting the optical path further comprises moving the optical element in a first direction based on the adjustment signal.

Claim 11. (Withdrawn) The method of claim 4 further comprising:

generating a power line, the power line representing a functional relationship of output power and positions of the optical element; and

determining a slope of the power line.

Claim 12. (Withdrawn) The method of claim 11 wherein adjusting the optical path further comprises moving the optical element in a first direction based on the slope.

Claim 13. (Withdrawn) The method of claim 12 wherein adjusting the optical path further comprises moving the optical element in a second direction based on the slope, the second direction being substantially opposite from the first direction.

Claim 14. (Withdrawn) The method of claim 11 wherein adjusting the optical path further comprises moving the optical element in a first direction when the slope is positive.

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Claim 15. (Withdrawn) The method of claim 14 wherein adjusting the optical path further comprises moving the optical element in a second direction when the slope is negative, the second direction being substantially opposite from the first direction.

Claim 16. (Withdrawn) The method of claim 11 further comprising determining a local minima of the power line.

Claim 17. (Withdrawn) The method of claim 16 wherein adjusting the optical path further comprises moving the optical element when the measured output power differs from the local minima.

Claim 18. (Withdrawn) The method of claim 4 further comprising:

determining a power function that relates output power and positions of the optical element along a plurality of axes; and  
determining a derivative of the power function.

Claim 19. (Withdrawn) The method of claim 18 wherein adjusting the optical path further comprises moving the optical element when the derivative is positive in a first direction along one of the plurality of axes.

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Claim 20. (Withdrawn) The method of claim 19 wherein adjusting the optical path further comprises moving the optical element when the derivative is negative in a second direction along one of the plurality of axes, the second direction being a direction substantially opposite of the first direction.

Claim 21. (Withdrawn) The method of claim 4 wherein measuring the output power further comprises:

measuring the output power at a first photodetector proximate the optical output; and

measuring the output power at a second photodetector proximate the optical output.

Claim 22. (Withdrawn) The method of claim 21 further comprising determining a power ratio of the measured output power at the first photodetector and the measured output power at the second photodetector.

Claim 23. (Withdrawn) The method of claim 22 wherein adjusting the optical path further comprise moving the optical element in a first direction if the power ratio is less than a predefined limit.

Claim 24. (Withdrawn) The method of claim 21 further comprising summing together the measured output power at the first photodetector and the measured output power at the second photodetector.

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Claim 25. (Withdrawn) The method of claim 24 wherein adjusting the optical path further comprises moving the optical element in a first direction if the summed output power is less than a predetermined limit.

Claim 26. (Withdrawn) The method of claim 1 wherein measuring the output power comprises determining a location of light at a photodetector proximate the optical output.

Claim 27. (Withdrawn) The method of claim 24 wherein adjusting the optical path further comprises moving the optical element in a first direction if the location of the light differs from predetermined location.

Claim 28. (Withdrawn) The method of claim 1 further comprises focusing the emitted light into the optical output by placing a lens in the established optical path.

Claim 29. (Withdrawn) The method of claim 1 wherein the optical output comprises a fiber.

Claim 30. (Withdrawn) The method of claim 4 wherein determining an expected output power comprises:

establishing a lookup table, the table having entries in which individual lasers in the laser array are each assigned a predetermined output power value and associated with a predetermined location identified for the optical element; and identifying an entry in the lookup table that corresponds to the selected laser.

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Claim 31. (Withdrawn) The method of claim 30 wherein adjusting the optical path is based on a comparison of the measured output power to the output power value for the selected laser and a comparison of location of the optical element and the predetermined location for the optical element for the selected laser.

Claim 32. (Withdrawn) The method of claim 30 wherein adjusting the optical path further comprises moving the optical element based on the predetermined location for the optical element for the selected laser and a current location of the optical element.

Claim 33. (Withdrawn) An optical transmission control apparatus comprising:

- an array of lasers;
- at least one optical element;
- an optical output, such that light from a laser from the array of lasers is directed into the optical output by the at least one optical element; and
- a controller coupled to the at least one optical element and configured to adjust the at least one optical element to maximize output power of the light directed into the optical output.

Claim 34. (Withdrawn) The apparatus of claim 33 wherein the optical output comprises a first region that reflects light emitted by a selected laser from the array of lasers.

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Claim 35. (Withdrawn) The apparatus of claim 34 further comprising a plurality of photodetectors proximate the optical output; and

wherein the controller is coupled to the plurality of photodetectors and configured to adjust the at least one optical element based on the optical power determined by each photodetector.

Claim 36. (Withdrawn) The apparatus of claim 34 further comprising a plurality of photodetectors proximate the optical output; and

wherein the controller is coupled to the plurality of photodetectors and configured to generate an error signal and to adjust the at least one optical element based on the generated error signal.

Claim 37. (Withdrawn) The apparatus of claim 33 wherein the optical output comprises a chiseled fiber.

Claim 38. (Withdrawn) The apparatus of claim 37 further comprising a plurality of photodetectors located at a periphery of the chiseled fiber, each photodetector configured to receive light reflected from the chiseled fiber and to determine an optical power of the received light at each photodetector; and

wherein the controller is coupled to the plurality of photodetectors and configured to adjust the at least one optical element based on the optical power determined by each photodetector.

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Claim 39. (Withdrawn) The apparatus of claim 33 further comprising a plurality of photodetectors proximate the optical output; and

wherein the controller is coupled to the plurality of photodetectors and configured to adjust the at least one optical element based on the optical power determined by each photodetector.

Claim 40. (Withdrawn) The apparatus of claim 33 further comprising a plurality of photodetectors proximate the optical output; and

wherein the controller is coupled to the plurality of photodetectors and configured to generate an error signal and to adjust the at least one optical element based on the generated error signal.

Claim 41. (Withdrawn) The apparatus of claim 40 wherein the error signal is based on a comparison of the optical power determined and a predetermined set of optical power values.

Claim 42. (Withdrawn) The apparatus of claim 40 wherein the error signal is based on a location of light detected by each of the plurality of photodetectors.

Claim 43. (Withdrawn) The apparatus of claim 33 further comprising:

a first detector, the first detector measuring output power at the first detector;

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a second detector, the second detector measuring output power at the second detector; and

wherein the controller determines a ratio of the measured output power at the first detector versus the measured output power at the second detector and adjusts the at least one optical element when the ratio is less than a predefined limit.

Claim 44. (Withdrawn) The apparatus of claim 33 further comprising:

a first detector, the first detector measuring output power at the first detector;

a second detector, the second detector measuring output power at the second detector; and

wherein the controller sums the measured output power at the first detector with the measured output power at the second detector and adjusts the at least one optical element when the summed measured output powers exceeds a predetermined limit.

Claim 45. (Withdrawn) The apparatus of claim 33 further comprising:

a first detector, the first detector measuring output power at the first detector as a first detected power;

a second detector, the second detector measuring output power at the second detector as a second detected power;

a third detector, the third detector measuring output power at the third detector as a third detected power; and

a fourth detector, the fourth detector measuring output power at the fourth detector as a fourth detected power.

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Claim 46. (Withdrawn) The apparatus of claim 45 wherein the controller is configured to determine a ratio of one of a first, second, third and fourth detected power versus a different one of a first, second, third, and fourth detected power and to adjust the at least one optical element when the ratio differs from a predetermined ratio.

Claim 47. (Withdrawn) The apparatus of claim 33 further comprising:

a first detector, the first detector measuring output power at the first detector as a first detected power;

a second detector, the second detector measuring output power at the second detector as a second detected power; and

a third detector, the third detector measuring output power at the third detector as a third detected power.

Claim 48. (Withdrawn) The apparatus of claim 47 wherein the controller is configured to determine a ratio of one of a first, second, and third detected power versus a different one of a first, second, and third detected power and to adjust the at least one optical element when the ratio differs from a predetermined ratio.

Claim 49. (Withdrawn) The apparatus of claim 33 further comprising a position detector proximate the optical output and configured to determine a location of light incident on the position detector.

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Claim 50. (Withdrawn) The apparatus of claim 49 wherein the controller is configured to adjust the at least one optical element when the determined location differs from a predetermined location.

Claim 51. (Currently Amended) ~~The apparatus of claim 33 further comprising~~ An optical transmission control apparatus comprising:

an array of lasers;

at least one optical element;

an optical output, such that light from a laser from the array of lasers is directed into the optical output by the at least one optical element;

a controller coupled to the at least one optical element and configured to adjust the at least one optical element to maximize output power of the light directed into the optical output; and

a detector proximate the optical output and having a plurality of regions and configured to measure output power of light emitted from a selected laser that strikes each region.

Claim 52. (Original) The apparatus of claim 51 wherein the controller is configured to adjust the at least one optical element based on the output power measured at each region.

Claim 53. (Currently Amended) ~~The apparatus of claim 33 further comprising:~~ An optical transmission control apparatus comprising:

an array of lasers;

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at least one optical element;  
an optical output, such that light from a laser from the  
array of lasers is directed into the optical output by the at  
least one optical element;

a controller coupled to the at least one optical element  
and configured to adjust the at least one optical element to  
maximize output power of the light directed into the optical  
output; and

a detector proximate the optical output and having a  
plurality of regions and configured to determine locations of  
light emitted from a selected laser that strikes the plurality  
of regions.

Claim 54. (Original) The apparatus of claim 53 wherein the  
controller is configured to adjust the at least one optical  
element based on the determined locations of light.

Claim 55. (Withdrawn) The apparatus of claim 33 wherein the  
optical output comprises an angled cleaved fiber.

Claim 56. (Withdrawn) The apparatus of claim 55 further  
comprising a detector proximate the optical output, such that  
the angled cleaved fiber reflects a portion of the light emitted  
from the laser to the detector.

Claim 57. (Withdrawn) The apparatus of claim 56 wherein the  
controller is coupled to the detector and is configured to  
adjust the at least one optical element based on location of the  
reflected portion of light incident upon the detector.

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Claim 58. (Withdrawn) The apparatus of claim 56 wherein the controller is coupled to the detector and is configured to adjust the at least one optical element based on optical power measured by the detector.

Claim 59. (Withdrawn) The apparatus of claim 56 further comprising a second lens that focuses the reflected portion of light to the detector.

Claim 60. (Withdrawn) The apparatus of claim 33 further comprising a wavelength locker having a tap coupled to the optical output; and

wherein the controller is configured to adjust the at least one optical element based on output power of the light detected by the tap of the wavelength locker.

Claim 61. (Withdrawn) The apparatus of claim 33 further comprising a wavelength locker being in-line with the optical output; and

wherein the controller is configured to adjust the at least one optical element based on output power of the light detected by the wavelength locker.

Claim 62. (Withdrawn) The apparatus of claim 33 wherein the optical output comprises a fiber.

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Claim 63. (Original) An optical transmission control apparatus comprising:

- an array of lasers having lasers configured to emit light;
- an optical output configured to receive light;
- a detector near the optical output;
- at least one optical element configured to receive light from a laser from the array of lasers and to direct a portion of the light to the optical output and a portion of the light to the detector; and
- a controller being coupled to the at least one optical element and configured to adjust the at least one optical element to maximize output power of the light directed into the optical output.

Claim 64. (Original) The apparatus of claim 63 wherein the controller is coupled to the detector and is configured to adjust the at least one optical element based on location of the portion of light incident upon the detector.

Claim 65. (Original) The apparatus of claim 63 wherein the controller is coupled to the detector and is configured to adjust the at least one optical element based on optical power of the portion of light measured by the detector.

Claim 66. (Original) The apparatus of claim 63 wherein the portion of light directed to optical output has a greater optical power than the portion of the light directed to the detector.

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Claim 67. (Original) The apparatus of claim 63 wherein the at least one optical element comprises a beam splitter.

Claim 68. (Withdrawn) The apparatus of claim 63 wherein the at least one optical element comprises a mirror.

Claim 69. (Withdrawn) The apparatus of claim 68 wherein the mirror has a front face and a back face, the front face reflecting light to the optical output and the back face reflecting light to the detector.

Claim 70. (Withdrawn) The apparatus of claim 68 wherein the mirror has a front face and a back face, the front face reflecting light to the detector and the back face reflecting light to the optical output.

Claim 71. (Withdrawn) An optical transmission control apparatus comprising:

- an array of lasers comprising a first laser and a second laser, the first laser configured to emit light and the second laser configured to emit light;

- an optical output configured to receive light from the first laser;

- a detector near the optical output and configured to receive light from the second laser;

- at least one optical element configured to receive light from the first and second lasers; and

- a controller being coupled to the at least one optical element and configured to adjust the at least one optical

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element to maximize output power of the light received by the optical output.

Claim 72. (Withdrawn) The apparatus of claim 71 wherein the controller is coupled to the detector and is configured to adjust the at least one optical element based on location of the light received by the detector.

Claim 73. (Withdrawn) The apparatus of claim 71 wherein the controller is coupled to the detector and is configured to adjust the at least one optical element based on optical power of the light received by the detector.

Claim 74. (Withdrawn) The apparatus of claim 71 wherein the second laser is adjacent to the first laser.

Claim 75. (Withdrawn) The apparatus of claim 71 wherein the second laser is a predetermined distance from the first laser.

Claim 76. (Withdrawn) The apparatus of claim 75 wherein the predetermined distance is based on spacing of the lasers in the array and total distance of an optical path of light emitted from a laser of the array of lasers to the optical output.

Claim 77. (Withdrawn) The apparatus of claim 75 wherein the predetermined distance is proportional to a distance from the optical output to the photodetector.

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Claim 78. (Withdrawn) The apparatus of claim 71 wherein the first laser is a laser having a wavelength that corresponds to a desired wavelength.

Claim 79. (Withdrawn) The apparatus of claim 71 wherein the first laser is configured to produce an image that is received by the detector, and the controller is configured to adjust the at least one optical element based on location of the image received by the detector.

Claim 80. (Withdrawn) An optical transmission control apparatus comprising:

emitting means for emitting light having different wavelengths;

output means;

optical means for directing light having a particular wavelength from the emitting means into the output means; and

control means coupled to the optical means and for adjusting the optical means to maximize output power of the light directed into the output means.

Claim 81. (Withdrawn) The apparatus of claim 80 further comprising reflective means for reflecting light from the emitting means and directed to the output means.

Claim 82. (Withdrawn) The apparatus of claim 81 further comprising sensing means for sensing light and is proximate the output means; and

wherein the control means is coupled to the sensing means

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and adjusts the optical means based on light sensed by the sensing means.

Claim 83. (Withdrawn) The apparatus of claim 82 wherein the control means is coupled to the sensing means and generates an error signal to adjust the optical means based on the generated error signal.

Claim 84. (Withdrawn) The apparatus of claim 83 wherein the error signal is based on a comparison of optical power determined by the sensing means and predetermined optical power values.

Claim 85. (Withdrawn) The apparatus of claim 83 wherein the error signal is based on a location of light detected by the sensing means.

Claim 86. (Withdrawn) The apparatus of claim 83 wherein the error signal is based on ratios of measured output power sensed by the sensing means and the control means adjusts the optical means when the ratios are less than a predefined limit.

Claim 87. (Withdrawn) The apparatus of claim 83 wherein the error signal is based on addition of measured output power by the sensing means and the control means adjusts the optical means when the measured output power added together exceeds a predetermined limit.

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Claim 88. (Withdrawn) The apparatus of claim 83 wherein the error signal is based on ratios of measured output power sensed by the sensing means and the control means adjusts the optical means when the ratios differ from predefined ratios.

Claim 89. (Withdrawn) The apparatus of claim 82 wherein the control means is configured to adjust the optical means when the determined location of the optical means differs from a predetermined location.

Claim 90. (Currently Amended) ~~The apparatus of claim 82~~ An optical transmission control apparatus comprising:

emitting means for emitting light having different wavelengths;

output means;

optical means for directing light having a particular wavelength from the emitting means into the output means; and

control means coupled to the optical means and for adjusting the optical means to maximize output power of the light directed into the output means;

sensing means for sensing light and is proximate the output means;

wherein the control means is coupled to the sensing means and adjusts the optical means based on light sensed by the sensing means; and

wherein the optical means directs a portion of light from the emitting means to the sensing means.

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Claim 91. (Original) The apparatus of claim 90 wherein the control means is coupled to the sensing means and adjusts the optical means based on location of the portion of light incident upon the sensing means.

Claim 92. (Original) The apparatus of claim 90 the control means is coupled to the sensing means and adjusts the optical means based on optical power of the portion of light measured by the sensing means.

Claim 93. (Original) The apparatus of claim 90 wherein the optical means comprises a beam splitter.

Claim 94. (Withdrawn) An optical transmission control apparatus comprising:

a laser emitting light

an optical fiber;

optical means for directing the light from the laser into a pathway directed to the fiber; and

control means, coupled to the optical means, for adjusting the optical means to maximize output power of the light directed into the pathway directed to the fiber.